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Texas Fungi.—I. Some new Species of Puccinia

By W. H. Long, Jr.

The following species were collected by the writer in 1900–1901, mainly in the vicinity of Austin, Texas. They were submitted to Mr. E. W. D. Holway (to whom I am under many and lasting obligations for the many favors shown me), and also to Dr. P. Sydow.

The descriptions and drawings were made by the writer. The drawings, by the aid of an Abbe camera lucida, represent such forms as are usually seen under the microscope. They are made mainly from material boiled and mounted in lactic acid, as specimens thus treated are more nearly restored to their normal shape and size than when mounted in water; besides the acid brings out the germ pores and minor details. All drawings are made to the same scale ; a Bausch and Lomb one-inch ocular, and one-sixth inch objective were used, with the paper on a level with the base of the microscope, and are reduced one-half in reproduction.

Where the writer has more than one collection of a species, he has thought it best to mark, as type, that special collection from which the drawings and descriptions were made ; therefore under each species is given the date and number of the type material.

Puccinia cooperiae sp. nov.

I. Aecidia clustered into groups 3–6 mm. long, by 1–3 mm. broad. These clusters are scattered and intermixed with the uredo and teleutosori. Aecidia orange, oval-elliptical or orbicular, .3–.4

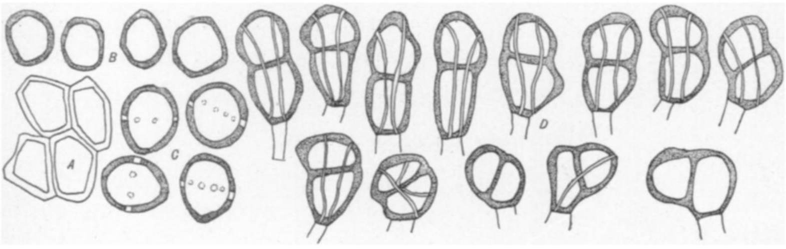

FIG. 1. *Puccinia cooperiae* on *Cooperia Drummondii*. *A*, four pseudoperidial cells. *B*, aecidiospores. *C*, uredospores. *D*, various forms of teleutospores.

mm. in diameter. Pseudoperidium prominent, somewhat reflexed and lacerate, white when desiccated. Cells of the pseudoperidium oval to irregularly polygonal. Aecidospores orange, oval, globose or irregularly polygonal, smooth or faintly granulose, 20–25 x 20–33 μ.

II. and III. Sori scattered over the leaves, intermixed.

Uredosori elliptical, chrome yellow, surrounded by the ruptured epidermis, .5 x 1–3 mm.

Uredospores yellow, minutely echinulate, obovate to globose, content yellow, appearing as oil globules when boiled in lactic acid ; germ pores apparently six and equatorially placed, 20–26 x 26–33 μ.

Teleutosori blue-black, long covered by the epidermis, but finally dehiscing through a median longitudinal fissure, surrounded by the ruptured epidermis, elliptical, .5–1 x 1–3 mm.

Teleutospores chestnut brown, smooth, very irregular in shape and insertion of the pedicel, especially the earlier spores ; usually oblong to oblong-oval, 20–26 x 33–50 μ ; apex rounded, blunt or sometimes truncate ; cells unequal, lower usually longer and more triangular than upper ; epispore prominently marked by several (usually four) longitudinal lines ; septum often oblique to insertion of pedicel ; pedicel fragile, about 10 μ long, tinted.

On *Cooperia Drummondii*, Austin, Texas, Jan. 23, 1901, no. 1106; Jan. 24, 1901, no. 1107; Feb. 12, 1901, no. 1108 ; Feb. 28, 1901, no. 1111; March 2, 1901, no. 873 ; March 16, 1901, no. 874 ; April 6, 1901, no. 1113 ; April 27, 1901, no. 881. On *Cooperia pedunculata*, Austin, Texas, March 17, 1901, no. 1112 (II.).

This plant was first found in its aecidial stage, the latter part of January, 1901; from February to May all the stages were common, often on the same leaf. The later and fully mature teleutospores have the septa more normally placed and the longitudinal bands more prominent than those of the earlier teleutospores. Type of aecidial stage, March 2, 1901, no. 873 for II. and III., April 27, 1901, no. 881.

Puccinia cohaesa sp. nov.

II. Sori scattered on under surface of leaves, pale yellow, flat, powdery, orbicular to oval, .6–.75 mm., intermixed with the teleutosori.

Uredospores semihyaline, epispore pale yellow, echinulate, apex thickened for about 5 μ ; germ pores four, equatorial ; obovate to oval-oblong, 15–18 × 28–40 μ. Paraphyses sparingly intermixed, hyaline, smooth, clavate to subcapitate, walls thick, pale yellow, 13–20 × 25–70 μ.

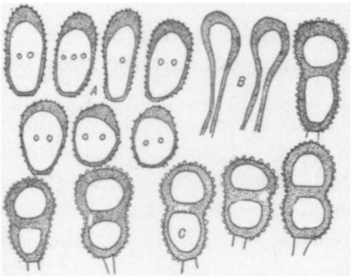

FIG. 2. *Puccinia cohaesa* on *Anemone Caroliniana*. *A*, various forms of uredo-spores. *B*, two paraphyses. *C*, teleutospores.

III. Sori usually scattered irregularly over the under surface of the leaves, but sometimes on both sides of the leaves and on the leaf stems, flat, purplish black, tardily naked, surrounded by the ruptured epidermis, powdery, very irregular in shape and size, from punctiform to orbicular and often 1–2 mm. in diameter; often concentric around a central sorus.

Teleutospores tuberculate, very uniform in size and shape, 20–23 × 34–50 μ; each cell usually regular in outline and subequal, firm, dark brown, spheroid, lower rarely attenuate, not easily breaking apart, constriction medium; tubercles large, short, blunt, not dense; few enough to be counted. Pedicel hyaline, short, sometimes length of spore.

On *Anemone Caroliniana*, Austin, Texas, March to May, 1900, no. 49; March 6 to April 25, 1901. Type for II. sori, March 14, 1901, no. 1126. Type III., April 25, 1901, no. 1127.

Through the kindness of Mr. M. A. Carleton, of the U. S. Department of Agriculture, the writer was enabled to compare this species with the U. S. Department specimens of *Puccinia fusca* from various parts of the world. This examination convinced him that *Puccinia cohaesa* was not *Puccinia fusca*; differing as follows: gross characters entirely different; microscopic characters also different, except as to size of the teleutospores; further, *Puccinia fusca* has no uredospores nor paraphyses, both of which are present with *Puccinia cohaesa*.

The water found constantly preceding and associated with *Puccinia cohaesa*, on the same plants, an aecidial form closely resembling *Aecidium punctatum*. As no positive proof of any connection between the two was at hand, the writer has not included an aecidial stage in this description, preferring to wait till cultures are made to determine this point. This rust like *P. cooperiae* continued until the leaves of the host were killed by hot water.

Puccinia Texana Holway and Long, sp. nov.

Sori hypophyllous on spots; spots ferruginous when fresh, dark brown when desiccated; sori orbicular to oval, firm, .4–.5 mm. in diameter, ferruginous, often confluent.

II. Uredospores globose to obovate, 20–26 × 23–30 μ, light brown, immature spores obovate to ovate-pyriform, walls thick, minutely echinulate, light brown, with four germ pores lying in two zones on either side of the equator.

III. Teleutospores intermixed with the uredospores, often on the periphery of the sorus; teleutospores oval to slightly obovate; 20–28 × 26–40 μ; slightly constricted at the septum; apex somewhat or not at all thickened, cells subequal, epispore smooth, pedicel up to 50 μ long, hyaline; germinated and desiccated teleutospores collapsing inward at base and apex. (See Fig. 3, *c*.)

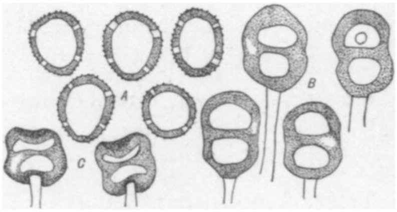

FIG. 3. *Puccinia Texana* on *Berberis trifoliolata*. *A*, uredospores. *B*, normal teleutospores. *C*, germinated teleutospores with apex and base depressed, the usual form seen in a water mount.

On *Berberis trifoliolata*, Austin, Texas, March 17, 1900, no. 44; Jan. to Dec., 1901. Type no. 44*a*, March 17, 1901.

This species is common in the vicinity of Austin, throughout, the entire year on the *Berberis* bushes, but usually only a few of the lower leaves are attacked by it. The teleutospores germinate while on the bushes. After germination the base and apex are much depressed (see Fig. 3, *c*), and this is the form usually seen under the microscope when the mount is in water; but if the teleutospores are first boiled in lactic acid, they swell out to their normal shape and size (see Fig. 3, *b*). Both uredo and teleutospores are present during the entire year, but the uredospores seem to predominate during the winter and spring months. The spots on the leaves usually appear only when the sori are old and fully matured, young sori being without the spots.

Puccinia similis sp. nov.

I. Aecidia irregularly scattered over the under side of the leaves, oval, oblong or irregular in shape, .5–1 mm.; pseudoperidium white, much exserted, with four or more lacerate segments which collapse over the aecidia when desiccated. Aecidiospores pale yellow, white when desiccated, verrucose, oval to globose, 20–27 x 27–30 μ.

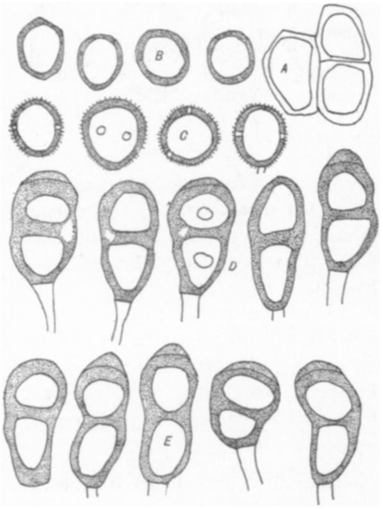

FIG. 4. *Puccinia similis* on *Verbesina Virginica*. *A*, pseudoperidial cells. *B*, aecidiospores. *C*, uredospores. *D*, earlier teleutospores. *E*, later and prevalent type of teleutospores.

II. Uredosori irregularly scattered over the under side of the leaves, often aggregated into groups, small, from punctiform to .5 mm. in diameter, powdery, ferruginous, often intermixed with the aecidia and later with the teleutosori.

Uredospores light brown, broadly ovate to subglobose, 23–26 x 24–28 μ, spinulose: germ pores apparently only two, equatorial.

III. Teleutosori thickly scattered over the entire under surface of the leaves, black, small, from punctiform to .75 mm., naked.

Teleutospores oblong, elliptical to subclavate, 23–33 x 40–54 μ: apex much thickened, rounded, constriction medium, cells usually unequal, lower often triangular, smooth, chestnut brown: pedicel usually shorter than the spore, but sometimes 60 μ long.

On *Verbesina Virginica*, Austin, Texas, Oct., 1900, to Feb., 1901; June to Dec., 1901. Type for I. and II., June 6, 1901, no. 866. Type II. and III., Dec. 1, 1900, no. 50.

The aecidia appear in June, intermixed during the latter part of the month with the uredosori, which continue till Oct., when teleutosori begin to prevail. Specimens of teleutospores collected in February have rust where the host is shaded.

Puccinia ximenesiae sp. nov.

Uredo- and teleutospores intermixed, sori scattered, mainly of teleutospores, on both sides of the leaves, black, orbicular, .5–1 mm. in diameter, semi-firm.

II. Uredospores light yellow, oval to globose, 17–30 x 20–30 μ, epispore echinulate: germ pores two.

III. Teleutospores chestnut brown, oval, slightly apiculate, 30–

34 × 42–50 μ; slightly or not at all constricted in the middle. Cells equal: pedicel short, stout, hyaline.

On *Verbesina encelioides* Gray (*Ximenesia encelioides* Cav.), Austin, Texas, Nov. 16, 1899, no. 65, by W. L. Bray.

This species was reported as common that year, but has not been collected since.

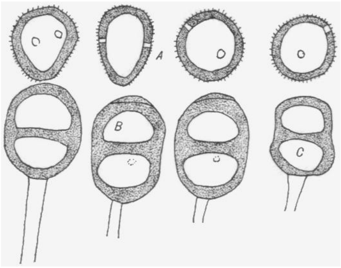

FIG. 5. *Puccinia ximenesiae* on *Verbesina encilioides*. *A*, uredospores. *B*, teleutospores when boiled in lactic acid. *C*, teleutospores when mounted in water.

Puccinia farinacea sp. nov.

Sori amphigenous, powdery.

II. Uredosori cinnamon brown, small, about .5 mm. in diameter, often densely covering parts of the leaf surface.

Uredospores subglobose, light brown, 20–26 μ, echinulate: germ pores two or three, mainly two and very prominent in fresh spores, with a convex cap over each pore.

III. Teleutosori scattered, black, orbicular, .5–1 mm. in diameter.

Teleutospores dark brown, broadly oval to subglobose, 26–30 × 30–34 μ, often apiculate, very slightly or not at all constricted at the septum, upper cell verrucose, lower faintly so: pedicel hyaline, weak, attenuate, about thrice the length of the spores; 1-celled teleutospores sparingly present,

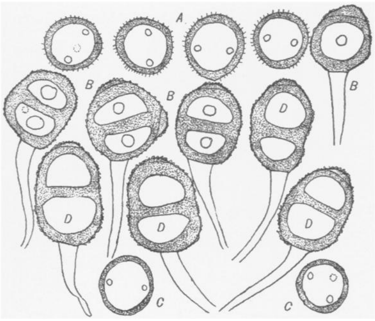

FIG. 6. *Puccinia farinacea* on *Salvia farinacea*. *A*, uredospores. *B*, teleutospores.

FIG. 7. *Puccinia ballotaeflora* on *Salvia ballotaeflora*. *C*, uredospores. *D*, teleutospores.

On *Salvia farinacea*, Austin, Texas, Oct. 31, 1900, no. 826; Nov. 12, 1900, no. 833 (type); April 4, 1901, no. 826 (II.); May 4, 1901, no. 858 (II.), and June 18, 1901. McNeal, Texas, May 12, 1901 (II).

Common on *Salvia farinacea* from April to December. Uredospores from April to October, teleutospores from then till frost kills the host.

Puccinia ballotaeflora sp. nov.

Uredospores intermixed with the teleutospores; light brown, echinulate, germ pores 2–3, oval to globose, 20–28 x 24–27.

III. Teleutosori powdery, mainly on the under side of the leaves, but sparingly on the upper surface; black; scattered, orbicular; punctiform to .75 mm. in diameter; sori on the upper surface mainly punctiform.

Teleutospores chestnut brown, both cells plainly verrucose, apiculate, slightly constricted at the septum, oval to elliptical, 24–30 x 37–50 μ; usual size 26 x 40 μ. Pedicel long, about twice the length of the spores, weak, hyaline, but *fulvous* near spores; somewhat attenuated near base. Septum often oblique or even perpendicular to the insertion of the pedicel. 1-celled teleutospores sparingly present.

On *Salvia ballotaeflora*, San Marcos, Texas, Nov. 19, 1900, no. 836.

The main points of difference between this and *P. farinacea* are as follows: Length and shape of teleutospores; this species having much longer and more elliptical spores; is also plainly constricted at septum, with upper and lower cell strongly verrucose, while *P. farinacea* has lower cell only faintly or not at all verrucose, with entire pedicel hyaline, and *P. ballotaeflora* has pedicel fulvous near the spore.